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(54) Rolling bearing unit with rotational speed sensor

(57) Manufacturing method for an encoder wheel (5)(50) for a rolling contact bearing (2) and relevant product, according to which a decoder element (5) made of plastoferrite is magnetised to obtain a magnetised multipolar ring (5); the magnetised multipolar ring (5) being coupled to a metallic insert (6) and being fixed for rotation with the metallic insert (6) by means of a mechanical and/or magnetic action.

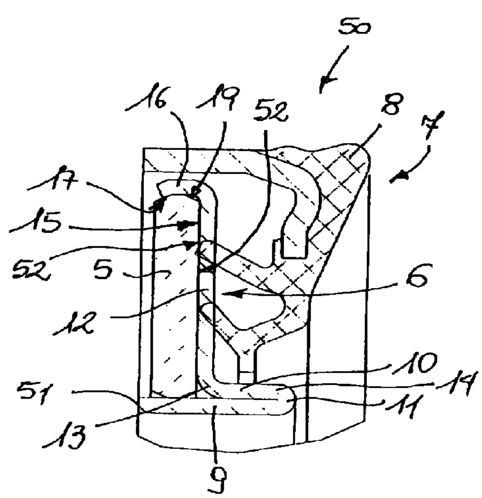

Fig. 3

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Description

[0001] The present invention relates to a manufacturing method for an encoder wheel for a rolling contact bearing and relevant product.

[0002] For the manufacturing of an encoder wheel to measure the rotation speed of the two rings of the bearing, and, therefore, of an encoder wheel whose qualities have to be minimum axial dimensions and maximum demandable accuracy, there is a well known, generally, method comprising a step of co-moulding a decoder element made of plastoferrite with an annular metallic support insert, and a step of magnetising the decoder element and the annular metallic insert at the same time to give magnetisation with alternating polarities to at least the decoder element realising the encoder wheel.

[0003] The method described above presents some drawbacks which diminish the reliability and the lifetime of the encoder wheel in a relatively drastic way. In fact, in view of the fact that the decoder element is co-moulded over the metallic insert heating the decoder element and the metallic insert at the same time, the different thermal expansion of the materials of the two annular elements give rise to thermal stress, and this thermal stress can influence the precision of the magnetic pole and the relevant signal of the encoder wheel, and can even cause the breakdown of the encoder wheel.

[0004] Furthermore, once the encoder wheel manufactured according to the method described above is coupled to a relevant watertight protection shield and is then assembled to the rolling contact bearing, the assembly stress created is not only are likely to increase the above mentioned thermal stress, but can also compromise the functioning of the encoder wheel itself.

[0005] In the end, the contemporaneous magnetisation of the decoder element and the metallic insert causes further homogeneity problems inside the encoder wheel, as the magnetisation acquired by the metallic insert not only behaves in a way substantially different from the magnetisation acquired by the decoder element, but even disturbs the performance.

[0006] It is an aim of the present invention to provide a manufacturing method for an encoder wheel for a rolling contact bearing which will overcome the drawbacks described above.

[0007] The above, and further aims which will be more apparent hereinafter, are achieved according to the present invention by the provision of a manufacturing method for an encoder wheel for a rolling contact bearing, the method being characterised by the fact that it comprises a step of magnetisation of a decoder element made of plastoferrite to obtain a magnetised multipolar ring, and a step of coupling the multipolar ring to a metallic insert to fix for rotation the multipolar ring with the metallic insert.

[0008] The present invention also relates to an encoder wheel for a rolling contact bearing.

[0009] According to the present invention an encoder wheel for a rolling contact bearing is realised, the encoder wheel comprises a magnetised multipolar ring and an annular metallic insert supporting said multipolar ring, the encoder wheel being characterised by the fact that the annular metallic insert comprises an annular receiving seat, and said multipolar ring being placed inside said receiving seat and being realised by magnetising a decoder element made of plastoferrite.

[0010] The invention will now be described with reference to the accompanying drawings, in which:

- FIG. 1 is an axial sectional view of a first preferred embodiment of an encoder wheel for a roller contact bearing in accordance with the present invention;
- FIG. 2 is a perspective view, with parts removed for the sake of clarity and on a reduced scale, of the encoder wheel shown in FIG. 1; and
- FIG. 3 is an axial sectional view of a second preferred embodiment of the encoder wheel for a roller contact bearing as shown in FIG. 1.

[0011] With reference initially to FIG. 1, With reference initially to FIGS. 1 and 2, the number 1 indicates overall an encoder wheel for a roller contact bearing 2 which is partially illustrated and comprises an inner ring 3 and an outer ring 4 mounted coaxially to each other and to a rotation axis (not shown) of the bearing 2 itself.

[0012] The encoder wheel 1 comprises a magnetised multipolar ring 5, which is made of plastoferrite, and is obtained by the magnetisation of a decoder element, an annular metallic shield 6 which supports the ring 5 itself.

[0013] The shield 6 is also part of a sealing device 7 between the rings 3 and 4, which also comprises an annular lip seal 8, which is maintained in sliding contact on the axially internal side of the shield 6 itself, and is integrally mounted to the ring 4 of the bearing 2. The sealing device 7 is suitable for preventing the infiltration of external polluting agents into the interior parts of the bearing 2, and for keeping lubricating oil inside the bearing 2 itself.

[0014] The shield 6 has a substantially T-shaped axial section, and comprises a cylindrical element 9 which is shrunk on to the ring 3, a further cylindrical element 10 partially overlapping the element 9 itself, and a raked linking portion 11 between the elements 9 and 10 facing the outside of the bearing 2. The shield 6 also comprises a radial portion 12, which extends transversally from the element 9 in correspondence to a median portion of the element 9 itself, and is integral to an extremity 13 of the element 10 opposite an extremity 14 of the element 10 itself joined to the raked linking por-

tion 11.

[0015] Finally, the shield 6 comprises a receiving seat 15 for the multipolar ring 5, and an input edge 16, which extends around the seat 15 itself, and is integral to the radial portion 12. The seat 15 has a substantially C-shaped axial section, and is delimited by the element 10, the radial portion 12 and the edge 16, which, respectively, define an internal cylindrical wall, a lateral radial wall and an external cylindrical wall of the seat 15 itself. The edge 16, apart from defining an annual input opening 17 for the ring 5 in the seat 15 facing the outside of the bearing 2, can also be a substantially elastic continuous border, or, as illustrated in Fig. 2, can comprise a number of fins 18, either elastic or otherwise refoldable to come into contact with the multipolar ring 5 in order to block the ring 5 itself inside the seat 15 rendering it fixed for rotation to the shield 6.

[0016] As previously described, the ring 5 is obtained by magnetising a decoder element in such a way as to present alternating polarities in a circumferential direction, and it forms part of a measuring device for measuring the relative rotation speeds between the rings 3 and 4 of the bearing 2. The ring 5 is arranged inside the seat 15 after being magnetised, and faces a sensor (noted but not illustrated), which is arranged outside the bearing 2, and is foxed for rotation to the stationary part of the bearing 2 itself, and is sensitive to any variations in the magnetic field due to the rotation of the ring 5 itself.

[0017] The ring 5 is provided with two blunt peripheral edges 19, and presents an external diameter which is substantially greater than an internal diameter of the edge 16, that is to say of the opening 17. In the case in which the edge 16 is a continuous elastic border, or the fins 18 are elastic fins, the ring 5 is snap mounted inside the seat 15 against an elastic force of the edge 16 or the fins 18. On the other hand, in the case in which the fins 18 are suitable for being refolded to come into contact with one of the two edges 19 of the ring 5, the latter is simply inserted inside the seat 15 in order to be successively blocked by the refolding of the fins 18 themselves.

[0018] As has already been mentioned, the manufacturing process of the encoder wheel begins with the magnetisation of the previously cited decoder element in such a way as to transform the decoder element itself into the magnetised multipolar ring 5. The process continues with the assembly of the ring 5 to the shield 6 which is carried out by snap mounting the ring 5 inside the seat 15 of the shield 6 itself against the elastic force of the edge 16. Once the ring 5 is arranged inside the seat 15, it is substantially radially compressed by the element 10 and the elastic force of the edge 16 on one of the edges 19 in such a way as maintain the ring 5 and the shield 6 fixed for rotation between themselves/in relation to each other.

[0019] In the case in which the edge 16 is provided with fins 18, once the ring 5 is inserted in the seat 15 without overcoming any elastic resistance from the edge 16 itself, the fins 18 are refolded to come into contact with one of the two edges 19 of the ring 5 itself rendering the ring 5 angularly integral with the shield 6.

[0020] At this point, the shield 6 is shrunk on to the internal ring 3 of the bearing 2 acting with a percussion element on the external part of the raked linking portion 11, and, in this way, is arranged with the radial portion 12 in sliding contact with the annular lip seal 8.

[0021] Figure 3 shows an encoder wheel 50 which is very similar to the encoder wheel 1, from which the encoder wheel 50 differs due to the fact that the raked linking portion 11 is arranged, in relation to the radial portion 12, on the opposite part of the seat 15, and does not define an internal wall of the seat 15 itself as for the encoder wheel 1. In this case, the above-mentioned internal wall of the seat 15 is directly defined by the element 9, and the multipolar ring 5 is, thus, radially blocked by the edge 16 and the element 9 itself.

[0022] The assembly of the ring 5 to the shield 6 in the encoder wheel 1 is carried out in the same way as previously described for the encoder wheel 1. On the other hand, the assembly of the encoder wheel 50 to the bearing 2 is carried out by acting with a percussion element on an external edge 51 of the element 9 opposite that which is integral to the raked linking portion 11.

[0023] Alternatively, or even in addition to the methods described above for making the ring 5 angularly integral with the shield 6, it is also possible to distribute adhesive material on a contact surface 52 of the shield 6 with the ring 5 itself. The surface 52 can be defined by a base surface of the seat 15, or by a lateral surface of the ring 5.

[0024] Finally, as another alternative, or even in addition to the methods described above for fixing the ring 5 angularly integral with the shield 6, it is possible to exploit the fact that the radial portion 12, being realised in a material which is sensitive to magnetisation, defines a preferential way for the closure of the magnetic field generated by the ring 5 in such a way as to define an attractional force between the ring 5 and the radial portion 12 which is suitable for coupling the ring 5 angularly integral with the shield 6.

[0025] Finally, the ring 5 and the shield 6 are further joined to each other due to the effect of the inevitable thermal expansion which the ring 5 undergoes during the functioning of the bearing 2.

Claims

1. Manufacturing method for an encoder wheel (5)(50) for a rolling contact bearing (2), the method being characterised by the fact that it comprises a step of magnetisation of a decoder element (5) made of plastoferrite to obtain a magnetised multipolar ring (5), and a step of coupling the multipolar ring (5) to a metallic insert (6) to fix for rotation the multipolar ring (5) with the metallic insert (6).

2. Method as claimed in Claim 1, characterised by the fact that said metallic insert (6) comprises a receiving seat (15) for said multipolar ring (5), and at least one input edge (16) extending around the seat (15); said step of coupling being a step of mechanical coupling, and comprising a step of snapping insertion of said multipolar ring (5) inside said seat (15) against a substantially elastic force of said input edge (16).

3. Method as claimed in Claim 1, characterised by the fact that said metallic insert (6) comprises a receiving seat (15) for said multipolar ring (5), and at least one input edge (16) extending around the seat (15); said step of coupling being a step of mechanical coupling, and comprising a step of refolding said input edge (16) to come into contact with said multipolar ring (5).

4. Method as claimed in Claim 3, characterised by the fact that said input edge (16) is a discontinuous edge comprising a number of fins (18) refoldable to come into contact with said multipolar ring (5).

5. Method as claimed in Claim 4, characterised by the fact that said multipolar ring (5) presents two peripheral opposite blunt edges (19).

6. Method as claimed in Claim 1 or 2 or 3, characterised by the fact that said step of coupling comprises a step of distributing an adhesive material on a contact surface (52) of said metallic insert (6) with said multipolar ring (5).

7. Encoder wheel (5)(50) for a rolling contact bearing (2), the encoder wheel (5)(50) comprises a magnetised multipolar ring (5) and an annular metallic insert (6) supporting said multipolar ring (5), the encoder wheel being characterised by the fact that the annular metallic insert (6) comprises an annular receiving seat (15), and said multipolar ring (5) being placed inside said receiving seat (15) and being realised by magnetising a decoder element (5) made of plastoferrite.

8. Encoder wheel as claimed in Claim 7, characterised by the fact that said annular metallic insert (6) comprises at least one input edge (16) extending around the seat (15).

9. Encoder wheel as claimed in Claim 8, characterised by the fact that said input edge (16) is provided with an inner diameter substantially smaller than an outer diameter of the multipolar ring (5).

10. Encoder wheel as claimed in Claim 8, characterised by the fact that said input edge (16) comprises a number of fins (18) refoldable to come into contact with said multipolar ring (5).

11. Encoder wheel as claimed in Claim 9 or 10, characterised by the fact that said multipolar ring (5) is provided with two peripheral opposite blunt edges (19).

12. Encoder wheel as claimed in any of the Claims from 7 to 11, characterised by the fact that said annular metallic insert (6) comprises a first cylindrical portion (9) and a radial portion (12) that extends transversely from the first portion (9) to define said receiving seat (15) together with said input edge (16).

13. Encoder wheel as claimed in Claim 12, characterised by the fact that said annular metallic insert (6) comprises a second cylindrical portion, which overlaps the first cylindrical portion (9), and is interposed between the first cylindrical portion (9) and said radial portion (12).

14. Encoder wheel as claimed in Claim 12, characterised by the fact that said annular metallic insert (6) comprises a raked linking portion (11) between said first and second cylindrical portions (9, 10).

15. Encoder wheel as claimed in Claim 14, characterised by the fact that said raked linking portion (11) is placed on the same side of said receiving seat (15) as regards said radial portion (12).

16. Encoder wheel as claimed in Claim 14, characterised by the fact that said raked linking portion (11) is arranged opposite said receiving seat (15) as regards said radial portion (12); said first cylindrical portion (9) defining an inner annular wall of the receiving seat (15).

17. Encoder wheel as claimed in any of the Claims from 7 to 16, characterised by the fact that said receiving seat (15) comprises a radial wall (12), which defines a preferential way for the closure of the magnetic field generated by the multipolar ring (5), and is able to give rise to an attractional force between the insert (6) and the multipolar ring (5) to make the insert (6) angularly integral with the multipolar ring (5).

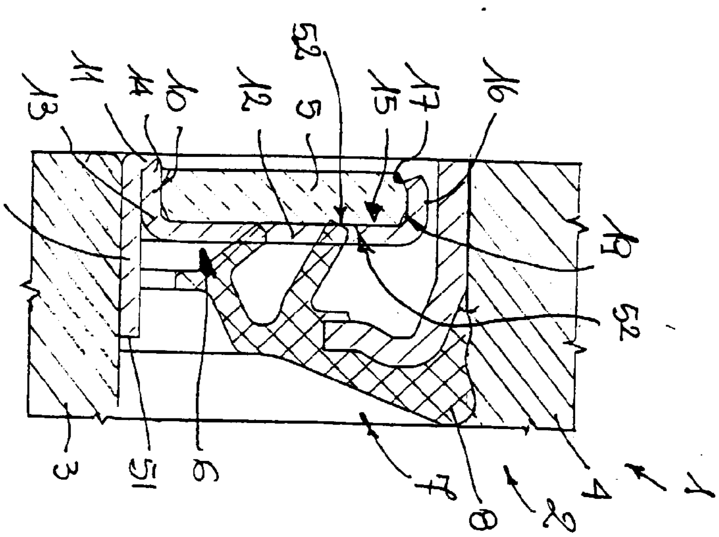

Fig. 1

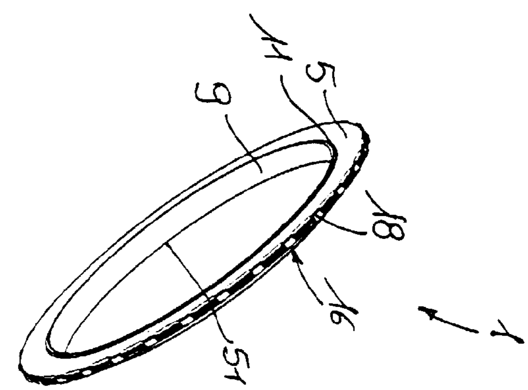

Fig. 2

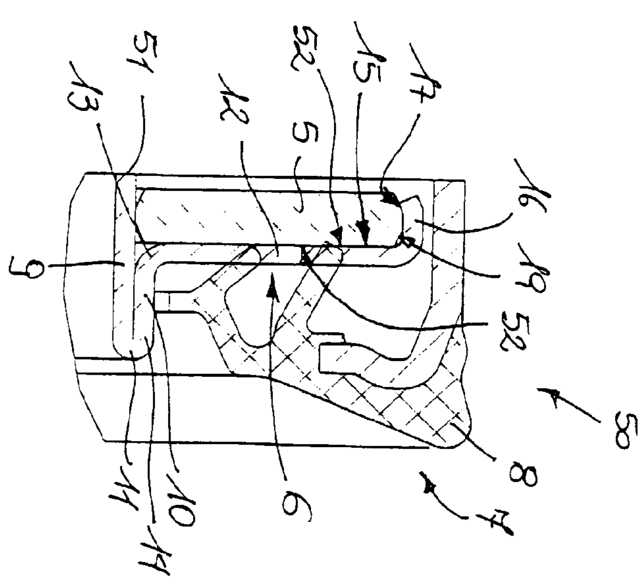

Fig. 3

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EUROPEAN SEARCH REPORT

Application Number
EP 99 11 9470

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
X	US 5 530 344 A (CAILLAUT CLAUDE ET AL) 25 June 1996 (1996-06-25) * column 3, line 19 - column 4, line 24; figures 1-4 *	1,7	G01P3/44 G01P3/487
Y		3,4,6,8,10	
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TECHNICAL FIELDS SEARCHED (Int.Cl.7)
G01P

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	19 January 2000	Chapple, I

CATEGORY OF CITED DOCUMENTS

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